Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ENTOMOLOGY.[1]

Sight in Insects.—In his recent address as President of the Biological Society of Washington, Dr. C. V. Riley[2] said : "Of the five ordinary senses recognized in ourselves and most higher animals, insects have, beyond all doubt, the sense of sight, and there can be as little question that they possess the sense of touch, taste, smell and hearing. Yet, save, perhaps, that of touch, none of these senses, as possessed by insects, can be strictly compared with our own, while there is the best of evidence that insects possess other senses which we do not, and that they have sense organs with which we have none to compare. He who tries to comprehend the mechanism of our own senses —the manner in which the subtler sensations are conveyed to the brain—will realize how little we know thereof after all that has been written. It is not to be wondered at, therefore, that authors should differ as to the nature of many of the sense organs of insects, or that there should be little or no absolute knowledge of the manner in which the senses act upon them. The solution of psychical problems may never, indeed, be obtained, so infinitely minute are the ultimate atoms of matter; and those who have given most attention to the subject must echo the sentiment of Lubbock, that the principal impression which the more recent works on the intelligence and senses of animals leave on the mind is that we know very little, indeed, on the subject. We can but empirically observe and experiment and draw conclusions from well attested results.

Sight.—Taking first the sense of sight, much has been written as to the picture which the compound eye of insects produces upon the brain or upon the nerve centers. Most insects which undergo complete metamorphoses possess in their adolescent states simple eyes or ocelli, and sometimes groups of them of varying size and in varying situations. It is difficult, if not impossible, to demonstrate experimentally their efficiency as organs of sight; the probabilities are that they give but the faintest impressions, but otherwise act as do our own. The fact that they are possessed only by larvæ which are exposed more or less fully to the light, while those larvæ which are endophytous, or otherwise hidden from light, generally lack them, is in itself proof that they perform the ordinary functions of sight, however, low in degree. In the imago state the great majority of insects have their simple eyes in addition to the compound eyes. In many cases, however, the former are more or less covered with vestiture, which is another evidence that their function is of a low order, and lends weight to the view that they are useful chiefly for near vision and in dark places. The compound eyes are prominent and adjustable in proportion as they are of service to the species, as witness those of the common house-fly and of the Libellulidæ or dragon flies. It is obvious from the structure of these compound eyes that impressions through them must be very different from those received through our own, and, in point of fact, the late experimental researches of Hickson, Plateau, Tocke and Lemmermann, Pankrath, Exner and Viallanes, practically established the fact, that while insects are shortsighted and perceive stationary objects imperfectly, yet their compound eyes are better fitted than the vertebrate eye for apprehending objects set in relief or in motion, and are likewise keenly sensitive to color.

---

[1] Edited by Clarence M. Weed, New Hampshire College, Durham, N. H.

[2] Insect Life, VII, p. 33.

So far as experiments have gone they show that insects have a keen color sense, though here again their sensations of color are different from those produced upon us. Thus, as Lubbock has shown, ants are very sensitive to the ultra violet rays of the spectrum, which we cannot perceive, though he was led to conclude that to the ant the general aspect of nature is presented in an aspect very different from that in which it appears to us. In reference to bees, the experiments of the same author prove clearly that they have this sense of color highly developed, as indeed might be expected when we consider the part they have played in the development of flowers. While these experiments seem to show that blue is the bee's favorite color, this does not accord with Albert Müller's experience in nature, nor with the general experience of apiarians, who, if asked, would very generally agree that bees show a preference for white flowers."

Origin of Reproductive Cells in Insects.—J. W. Tutt discussing the life history of a lepidopterous insect says of this subject:[3] "The earliest development of the ovum and spermatozoon in the embryo of insects is very obscure, but it would appear that the primitive ovaries are composed of a mass of cells, produced by an infolding of the ectoderm; but whilst some writers assert that they arise from the ectoderm, others consider them to be derived from the mesoderm, whilst still others trace their origin back to certain so-called pole cells, which originate even before the blastoderm is formed. However, this

[3] Entomologists Record, V, 246.

may be, it would appear, that they are in that early stage quite indistinguishable from other blastoderm cells.

" Therefore, it would appear, that whilst the great mass of cells become differentiated into various structures which subserve a special purpose, or perform their several functions, certain cells in the ovary retain their primitive condition, and with it the power, under suitable conditions, of forming another individual of the same species. On this subject Mr. Woodworth writes: 'About the time of the completion of the blastoderm, the already differentiated ventral plate infolds at a point on the median line about two-thirds from the upper end, and forms a very narrow pocket. The cells composing it look like the rest of the cells of the ventral plate at this time, they are almost round, and have a lining on one side made of the grey matter which originally bordered the whole egg, but which became a part of the blastoderm cells. The pocket remains open but a short time, but there is a long depresssion of the upper end of the bunch of cells; the mass of cells is soon cut off from the ventral plate and they are then free in the body cavity, but remain in contact with the ventral plate at the point where they were produced. Later stages show that these cells produce the generative organs; the generative organs thus appear to be produced by an infolding of the ectoderm, or possibly of the blastoderm, before the ectoderm is produced, but from a portion which is later to become ectoderm.' "

Alimentary Canal in Orthoptera.—Dr. F. Werner has compared[4] the relative length of the intestine in vegetarian and insectivorous Orthoptera. The result was unexpected. The plant-eating Acridiidæ have a short, almost straight gut, rarely larger than the body; while the Locustidæ have a longer gut usually spirally coiled, especially in Barbitistes and Phaneroptera. Werner believes that the length and coiling of the intestine have nothing to do with the diet, but are correlated with the shape of the body and the habits of life.—*Journal Royal Microscopical Society.*

North American Jassoidea.—Mr. Edward P. Van Duzee has published an excellent Catalogue of the Described Jassoidea of North America.[5] It covers more than fifty pages, and is especially full in bibliography and synonymy. "The classification and arrangement here adopted is substantially that proposed by the author in his 'Synopsis' published in these Transactions, Vol. XIX, pp. 296–300, December, 1892. The superfamily term there suggested includes those families in which the hind tibiæ are multispinose. These in our North American fauna are Ulopidæ, Ledridæ, Bythoscopidæ, Tettigoniidæ and Jassidæ. The first of these might perhaps be removed from this series, and the second united with the Tettigoniidæ as a subfamily of equal value with Gyponina and Tettigoniina. The position assigned to the family Bythoscopidæ is purely arbitrary, as it strictly parallels the Jassidæ, to which it is allied by Macropsis, and in a linear arrangement might with equal propriety follow the Tettigoniidæ."

---

[4] Biolog. Centralbl., XIV, (1894), pp. 116–9.

[5] Trans. Am. Ent. Soc., XXI, July, 1894.

The Use of Parasitic and Predaceous Insects.—There has recently been much discussion concerning the utilization of parasites and predaceous insects in destroying injurious species. A knowledge of the conditions under which such insects act would render it evident that we cannot hope to exterminate any species of noxious insect by means of its parasites alone; and many too sanguine expectations have been aroused. But, on the whole, parasitic and predaceous insects are of immense service to man. Without them many plant feeding species would multiply to such an extent that the production of certain crops would require vastly more effort than it does now. To say, as has been said, that parasitic and predaceous insects have no economic value, is to put the case too strongly. Take, for example, two crop pests of the first class—the army worm and the hessian fly. The history of a century shows that these insects fluctuate in numbers; that there are periods of immunity from their attacks followed by seasons when they are overwhelmingly abundant. It is universally acknowledged that in the case of the hessian fly, this periodicity is due almost entirely to the attacks of parasites, and in the case of the army worm to the attacks of parasites, predaceous enemies and infectious diseases. Remove these checks and what would be the result? The pests would keep up to the limits of their food supply and would necessitate the abandonment of the culture of the crops on which they feed. Take another case: Professor J. B. Smith has argued that "under ordinary conditions neither parasites nor predaceous insects advantage the farmer in the least," and to prove it he cites this instance: "Fifty per cent of the cutworms found in a field early in the season may prove to be infected with parasites, and none of the specimens so infested will ever change to moths that will reproduce their kind. Half of the entire brood has been practically destroyed and sometimes even a much larger proportion; but—and the 'but' deserves to be spelled with capitals—these cutworms will not be destroyed until they have reached their full growth and have done all the damage to the farmer that they could have done had they not been parasitized at all. In other words, the fact that fifty per cent of the cutworms in his field are infested by parasites does not help the farmer in the least." But obviously it does help the farmer very greatly *the next season*, for it reduces by half the number of cutworms he will have to contend with. As a matter of fact cutworms fluctuate in numbers in a way quite similar to the army worm, and the fluctuations are largely due to parasitic enemies. I have seen regions where cutworms were so abundant that grain fields were literally cut off by them as by a mowing machine, and the following season the worms were so scarce as to do practically no damage. Even the plum curculio and the Colorado potato bettle are sometimes so scarce as to require no protection against them, and presumption is in favor of parasites as a cause of their scarcity.

But Professor Smith is right in saying that as a general rule there is too great a tendency to rely on natural enemies to subdue insect attack. It is nearly always safer to adopt effective measures in keeping pests in check than to trust to the chance of their natural enemies subduing them. As Dr. C. V. Riley has pointed out, "there are but two methods by which these insect friends of the farmer can be effectually utilized or encouraged, as for the most part they perform their work unseen and unheeded by him, and are practically beyond his control. These methods consist in the intelligent protection of those species which already exist in a given locality and in the introduction of desirable species which do not already exist there."

CLARENCE M. WEED.

Oviposition in Acridiidæ.—M. J. Künckel d'Herculais describes[6] the means by which these Orthoptera bury their abdomen in the ground; there is no perforation of the ground, the hinder part of the body is merely forced into it; as the Arabs say the female "plantent." On dissecting females whose abdomen had reached the maximum of distension, the author was surprised to find that the abdomen was filled with air; on the air being withdrawn, the abdomen was reduced from 8 to 5 cm. in length. When the position is firmly taken up the females of the migratory locust maintain the parts of their genital armor as widely separated as possible, and secrete a viscous material which agglutinates the grains of sand, or the particles of earth at the bottom of the cavity, and they then begin to lay their eggs. These and the viscous material are emitted simultaneously, but the latter is peripheral and so consolidates the walls of the cavity which has the curved form of the abdomen. When the eggs are laid the viscous material continues to be shed, and on drying forms a stopper which protects the cavity.—*Journal Royal Microscopical Society.*

---

[6] Comptes Rendus, CXIX, 1894, pp. 244–7.

The Use of Chinch Bug Diseases.—In Bulletin No. 5 from the office of the State Entomologist of Illinois, Professor S. A. Forbes summarizes the results of years of careful experiment with the white muscardine disease of the Chinch Bug as follows:

1. The white muscardine will not spread among vigorous chinch bugs in the field in very dry weather to an extent to give this disease any practical value as a means of promptly arresting serious chinch bug injury under such conditions. It may be added that chinch bugs are usually vigorous in dry weather.

2. It is most likely to "catch" in low spots, where the soil is kept somewhat moist by dense vegetation, a mat of fallen herbage, or the like. Shocks of corn, especially when the crop is cut early, furnish excellent places for the development of this disease.

3. If decidedly wet weather follows upon its introduction, even after an interval of several weeks, it is likely to start up and take visible effect; but continuous rains, depressing the vital energies of the insect, are commonly requisite to its efficient action.

4. It is always so generally prevalent, in a more or less latent state, among the chinch bugs of Illinois, both north and south, that it is very likely to appear and spread, as if spontaneously, whenever conditions favorable to its development long prevail, whether it has been purposely introduced or not.

5. The time elapsing between the establishment of such favorable conditions and the full development of the disease among the chinch bugs of any locality, may possibly be shortened if the infection has previously been introduced by any artificial means.

6. Whatever weakens the insect favors its spread, as a rule. It is consequently much more likely to attack adults than young, especially spent males and females which have laid their eggs, and which are soon to die of old age; but it nevertheless often kills young of all ages. In agreement with the above, we have noticed that the fall generation of adults is less subject to it, other things being equal, than the generation which matures in midsummer. As this fall brood is to live or winter before laying its eggs, it contains no worn-out adults.

7. We have lately ascertained that it may destroy the *eggs* of the chinch bug, and as these are commonly laid where they are kept more or less moist, this fact contains a suggestion of increased usefulness and a valuable hint as to the best time for introducing the infection into the field.

8. The fungus producing this disease will not *start* to grow on dead chinch bugs, if we may judge from the results of several experiments made this summer. Wherever a dead chinch bug shows its presence, consequently, it has made its attack on the living insect.

9. The resistant power of healthy chinch bugs exposed to infection is well shown by the fact that thousands of bugs, young and old, have commonly lived for many days, and even for several weeks, moulting, maturing, copulating, and laying their eggs, when shut up in infection boxes which had been heavily stocked with fungus spores from dead insects and had been made in every way as favorable as possible to the development of the disease. The percentage of those that would succumb from day to day was often ridiculously small.

10. The growth of the fungus in such boxes is sometimes checked and the whole experiment brought to a standstill by the appearance in the boxes of minute mites (apparently brought in with the food supplied to the bugs), which multiply in the boxes and greedily devour the fungus of white muscardine as fast as it grows.

11. Comparative experiments with fungus spores from diseased chinch bugs and with those derived from artificial cultures on corn meal moistened with beef broth, show that the latter are nearly, if not quite, as efficient agents of infection as the former. We have used only cultivated spores one or two removes from the growth on the insect, and consequently are not prepared to say that continued cultivation on an inanimate medium might not finally diminish the virulence of the fungus parasite ; but, on the other hand, we have no very good reason to suppose that this will prove to be the case. I have no doubt, however, that by a properly guarded procedure, these artificial cultures, which can easily be made in almost unlimited quantity, may be utilized for a dissemination of the spores of these insect diseases, with great advantage in convenience, expedition; and economy of operation.

From all our experimental work thus far completed, I draw the general conclusion that infection with the fungus of the white muscardine of the chinch bug is an uncertain measure, largely dependent for its practical value upon conditions beyond the influence of the experimenter, and whose occurrence or prevalence it is impossible for him to foresee. It appears, on the other hand, to be so powerful an agency for the destruction of chinch bugs *en masse* when the weather favors its development and spread, and can be made by proper organization so inexpensive to the individual and the State, that it is well worthy of the most thoroughgoing scientific study and practical field experimentation.